

Serial No. 10/646,310  
67,008-073  
S-5674

**AMENDMENTS TO THE SPECIFICATION:**

Please replace the following numbered paragraphs with the following rewritten paragraphs:

- [28] Rotation of the outer ring 42 relative the inner ring 44 braids the multiple of individual fibers 36 to form the braided sleeve 38. Braiding machines are typically known and are often utilized in textile manufacturing with low strength fibers to form generally tubular garments. Braiding of filaments and the teaching provided herein is well within the skill of ~~an~~ one of ordinary skill in the art of textile manufacture.
- [30] Referring to Figure 6, the braided sleeve 38 is preferably a tri-axial braid. Bias angle fibers are preferably located at a 40 degree angle from the center line of the spar (faying axis P) and are distributed around the girth of the mandrel 46. The bias angle fibers provides torsional strength to the spar 32 and provides two axes of the tri-axial braid. The third axis of the tri-axle braid includes zero degree fibers which provide axial strength to the spar 32. Zero degree fibers are located parallel to the axis P. The zero degree fibers are positioned to be on the upper and lower surfaces of the spar 32 and the 40 degree fibers are braided around the zero degree fibers. That is, tracking an individual 40 degree fiber would follow a spiral path around the mandrel 36 such that the spiral path would be at a 40 degree angle to the faying axis P of the spar 32. The leading and trailing edge conics of the spar 32 include bias angle fibers at preferably 40 to 45 degrees to the axis P of the spar 32. It should be understood that other fiber orientations and fiber arrangements will benefit from the present invention. Moreover, the spar 32 preferably includes a multiple of braided layers to provide a desired laminate thickness and physical properties.
- [31] Additional local reinforcement of the spar 32 is accomplished by separate composite layers (illustrated schematically at 33 35) at desired locations. That is, dry

Serial No. 10/646,310  
67,008-073  
S-5674

composite material sheets may additionally be located at desired locations within the fibers during the braiding cycle.

- [32] The zero degree fibers are preferably interwoven during the braiding cycle and are located in a fixed position relative to the axis of rotation A of the multi-axial braiding machine 40 and are maintained in tension to reduce ([an]) any strength reduction which may otherwise occur through bending of the fibers 36. Interweaving of the zero degree fibers increases the ballistic tolerance of the spar 32 as delamination is minimized through interaction of the braided geometry. Regarding the latter, the structural fibers of composite materials can be viewed as a plurality of redundant load paths wherein damage to one or more fibers can be mitigated by the load carrying capability of adjacent fibers.
- [33] Alternatively or additionally, the mandrel [[42]] 46 may be rotated during braiding to follow a twist in the spar 32. That is, a rotor spar is often twisted 10 to 12 degrees linearly along the span to improve aerodynamic efficiency and the braidbraided sleeve 38 which becomes the spar 32 once resin impregnated can be specifically oriented to accommodate such a twist.
- [34] Referring to Figure 76 7, once the braided sleeve 38 is formed upon the mandrel 46, the mandrel 46 is located within a matched metal mold 48. As the braided sleeve 38 is formed with dry filaments, the braiding cycle need not be related to impregnating resin processing; such that material storage and handling is reduced in complication which reduces labor intensive process steps and expense. Impregnating resin is preferably communicated into the matched metal mold 48 from a supply 50 and is pumped along a span of the metal mold 48 from a trailing edge of the matched metal mold 48 toward vents in a leading edge matched metal mold 48 to provide efficient manufacturing times. Other distribution schemes will also benefit from the present invention. The impregnating resin preferably includes a reactive resin component, curing agents, solvents and other agents. Typical resins include epoxy, epoxy novolacs and other thermosetting

Serial No. 10/646,310  
67,008-073  
S-5674

resins including polyesters, polyamides (both condensation and addition types), phenolic resins and bismaleimides. The resin may contain a thermoplastic or elastomeric agent to increase fracture resistance.